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LONG-RANGE PROPAGATION EXPERIMENT MIDWAY, AUGUST 1970
PROCEDURES AND SHIPBOARD DATA
NRL OPERATION 70-01-05

Naval Research Laboratory Washington, D.C.

NOVEMBER 1976

NRL Memorandum Report 3405

Long-Range Propagation Experiment: Midway, August 1970 Procedures and Shipboard Data NRL Operation 70-01-05

A. N. Guthrie, J. D. Shaffer, D. A. Nutile, and R. M. Fitzgerald

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Environmental-data compendium

North Pacific Basin

Bathymetry

Temperature profiles

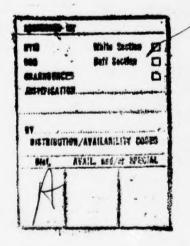
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In August 1970, a long-range acoustic propagation experiment was performed to measure propagation loss, signal fluctuations, and signal coherence. The experiment was conducted under the Long Range Propagation Program and the Very Low Frequency Program. Procedures for conducting the experiment and the shipboard data are reported here.

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LONG-RANGE PROPAGATION EXPERIMENT: MIDWAY, AUGUST 1970 PROCEDURES AND SHIPBOARD DATA NRL OPERATION 70-01-05

I. INTRODUCTION

The Naval Research Laboratory performed a long range acoustic propagation experiment in August 1970. Procedures for its conduct and the shipboard data obtained are reported here. The experiment was conducted under the Long Range Propagation Program and the Very Low Frequency Program. The objective was to measure propagation loss, signal fluctuations, and signal coherence as a function of range and azimuth from a suspended sound channel hydrophone. The hydrophone chosen was part of the Missile Impact Locating System (MILS) located near Midway Island.

The USNS J. WILLARD GIBBS (T-AGOR-1) followed the course charted in Fig. 1, repeating the radial course twice. The ship towed two continuous wave (cw) sources, dropped explosive charges, and made environmental and navigational measurements. A 114 Hz cw source was operated at a nominal depth of 21 m and a 15 Hz cw source at a nominal depth of 140 m. A total of 363 charges was dropped.

Note: Manuscript submitted October 28, 1976.

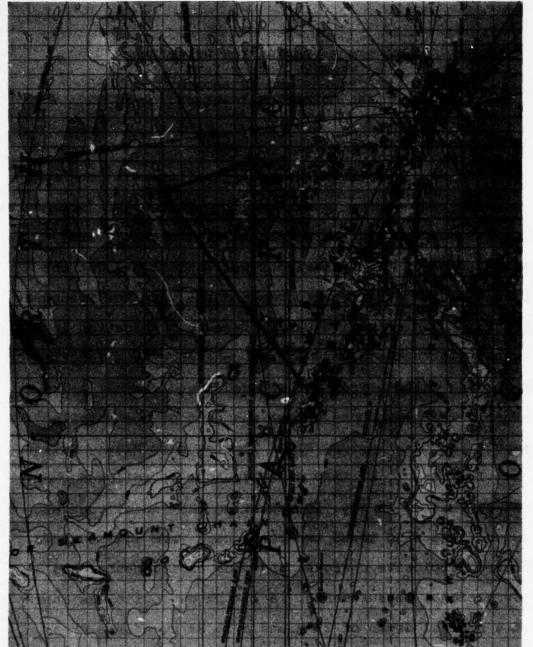


Fig. 1 - Ship's track

Two sizes of charges and three depths of detonations were used.

Other measurements made aboard ship include navigation, sea and weather conditions, bathymetry, temperature profile by means of expendable bathythermographs (XBT), and source operating parameters. The body of this report describes the measurements which are tabulated in the appendices.

II. SHIPBOARD DATA

All times are given by Julian day and Greenwich Mean Time. Clocks are synchronized to WWVH, Hawaii. Appendix I gives the relation between Julian day and day of the month for the year 1970.

A. Navigation

Ship's position was determined using two independent electronic navigation systems including a Navy Navigation Satellite System (NNSS) and a Loran C System. The NNSS receiver, Magnavox MX702, produced a hard copy output for each satellite fix. The navigator entered the data in a log together with the two input parameters, ship's course and speed. The Loran C receiver, Collins SPN 38 produced a Nixie Tube display of time and position. A fix was recorded every 15 minutes. The navigation data is contained in Appendix A.

B. Sea and Weather Conditions

Sea and weather conditions were noted hourly by the bridge. Appendix B contains the tabulated data.

C. Bathymetry

Bathymetry was measured continuously aboard ship using an AN/UQN 12 KHz Sonar Transceiver and a Raytheon 193C recorder. Data was recorded on standard teledeltos paper and later digitized by reading the recorded depths at selected times and punching the results on computer cards. Appendix C contains the bathymetric data for an assumed constant sound speed of 1500 m/sec.

D. Temperature Profiles

XBT casts were made every six hours. For every two Sippican Model T7 probes (design depth 760 meters), one Model T5 probe (design depth 1800 m) was dropped. The analog data from a Sippican Model MK-2 Recorder was read by the National Oceanographic Data Center (NODC) BT Section in standard format (°C at 5 m intervals) and supplied to us as a deck of punched cards and a machine listing. We are grateful to Mr. Richard E. Krentz, then Chief of the BT Section, for arranging this service. Appendix D contains the temperature profile data.

E. Archival Salinity and Sound Speed Profiles

Salinity, temperature, and sound speed vs. depth profiles along the ship's track were obtained from NODC Nansencast files. Only profiles taken in July, August, or September at locations within 100 nmi of the ship's track were selected from the files. Based upon the salinity data, the profiles were arranged in groups, each of which corresponded to some interval of the ship's track. Groups 1, 2 and 3 are associated with the radial tracks and groups 4, 5 and 6 with the tangential track. In Appendix E are tabulated for each group the average salinity profile, the average sound speed profile, and the standard deviation of the sound speed. Appendix E also contains a plot of the average salinity profile for each group.

F. Sound Speed Profiles

Sound speed profiles were obtained by using the measured XBT temperature profiles, the average salinity profiles of the Appendix E groups, and Leroy's second formula², which is equivalent to Wilson's second equation ³ to within 0.1 m/s. The archival temperature profiles for the groups in Appendix E were compared with each measured temperature profile to determine which group salinity profile to use in Leroy's formula. The calculated sound speed profiles are tabulated and plotted in Appendix F.

To facilitate a comparison between the calculated and archival sound speed profiles and to obtain a measure of confidence for the calculated profiles, each plot in Appendix F contains three curves. In addition to the calculated sound speed profile we have plotted the average archival sound speed profile plus/minus the standard deviation for the appropriate Appendix E group.

G. Explosive Sources

A total of 363 charges was dropped. Physically 289 of these charges were formed of six half-pound TNT blocks bound together with a 2.7 kg lead weight. Each charge was detonated with a fuse-fired Navy Type I blasting cap and a 1 oz. Composition C4 booster. For 163 of these charges the fuse length was cut for a nominal detonation depth of 200 m (1 dud) and 126 were fused for a nominal detonation depth of 775 m (16 duds). The remaining 74 charges were SUS, MK 59.0A, containing 0.8 kg of cyclotol and pressure detonated at 3000 m.

Appendix G contains the relevant shot parameters including time and depth of detonation. The tabulated shot time is the instant the shot pulse reaches a hydrophone located in a well on the ship corrected for travel time to the hydrophone. To determine shot depth, the difference in arrival time between the one bottom bounce arrival and

the one surface bounce— one bottom bounce arrival was measured. Assuming vertical propagation and a constant sound speed of 1500 m/s the tabulated shot depths were obtained.

H. CW Projector Parameters

Two CW sources were operated continuously during the experiment. A Hudson Laboratories Electromagnetic (EM) source was operated at approximately 114 Hz at a nominal depth of 21 m (~1.5 wavelengths). The unit was suspended from a starboard A-frame. A modified minesweep transducer (Mark 6) was operated at approximately 15 Hz. The unit was suspended from the stern U-frame and operated at a nominal depth of 140 m (~1.3 wavelengths).

The Mark 6 was phase locked to a frequency obtained by counting down from a crystal controlled frequency standard. The EM source frequencies were derived from a precision signal generator (Monsanto 3100A). The EM source was operated at its resonance frequency as determined by an impedance loop run at the beginning of each phase of the experiment.

I. Julian Day versus Day of the Month

Appendix I gives the relation between the Julian Day and the day of the month for 1970.

ACKNOWLEDGEMENTS

We wish to acknowledge the invaluable assistance of those who, thru their efforts and the generous application of their skills, made possible the successful completion of this experiment. The Naval Research Laboratory's personnel who participated were S. Adler, E. Andersen,
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and John Block, Manager of the MILS Facility - Midway, for their indulgence in making it possible to use the MILS
Facility at Midway even at the cost of some inconvenience to their work. We also than: R. Salmon, Master of the
USNS GIBBS, his officers and crew for their devotion and skill in operating the ship in a manner to meet the requirements of our experiment.

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APPENDIX A

This appendix contains the navigation data arranged in two tables (Al, NNSS, A2, Loran C), each accompanied by a figure.

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DAY......GHT
TIME.....GMT
LATITUDE....DEGREES AND MINUTES
LONGITUDE....DEGREES AND MINUTES

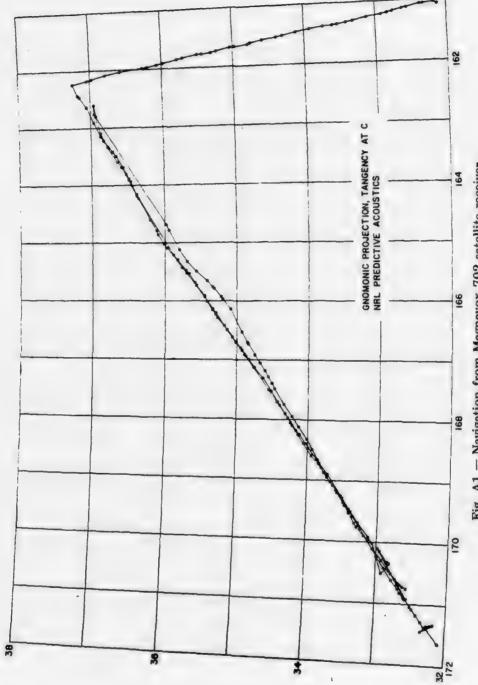
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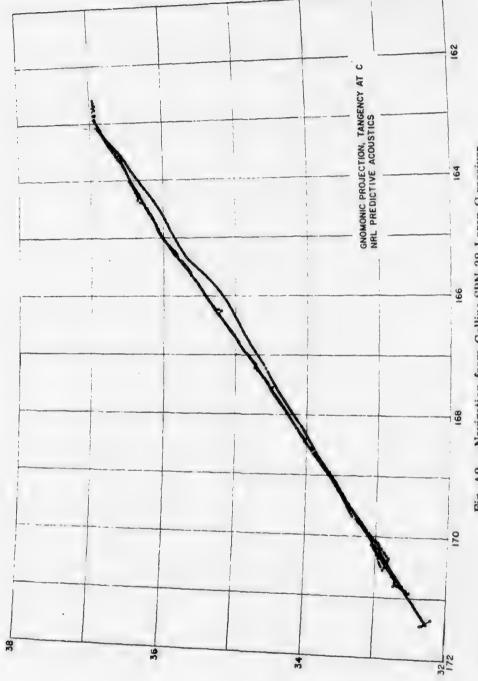


Fig. A2 - Navigation from Collins SPN 38 Loran C receiver

APPENDIX B

This appendix contains sea and weather data recorded by ship's personnel on the bridge.

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APPENDIX C

This appendix contains bathymetry as a function of time for an assumed sound speed of 1500 m/s.

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APPENDIX D

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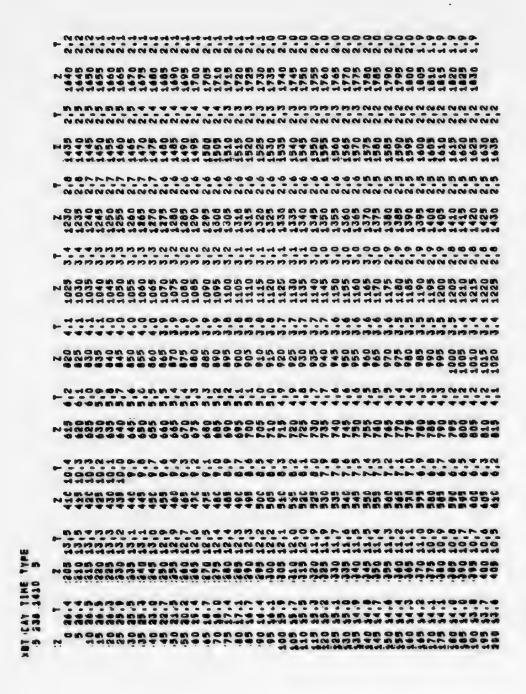
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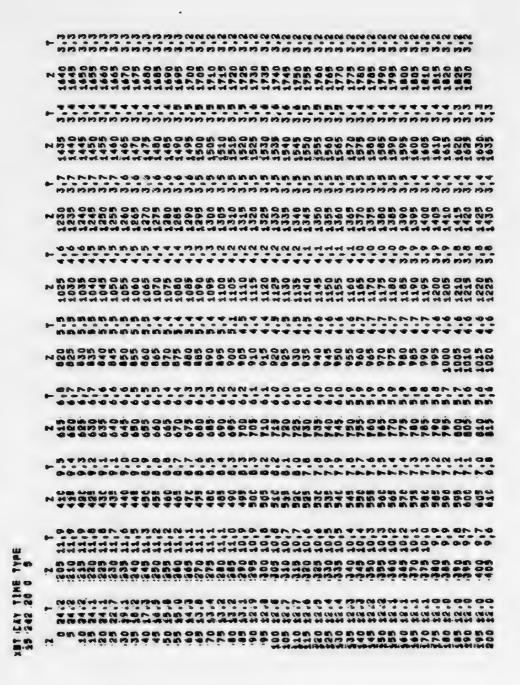
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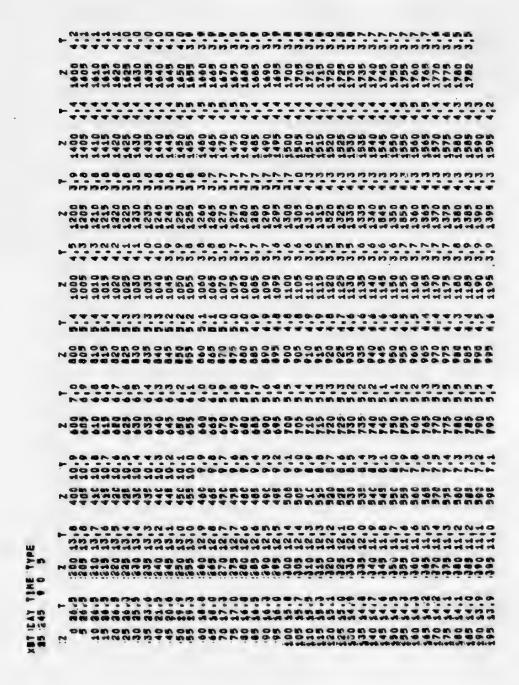
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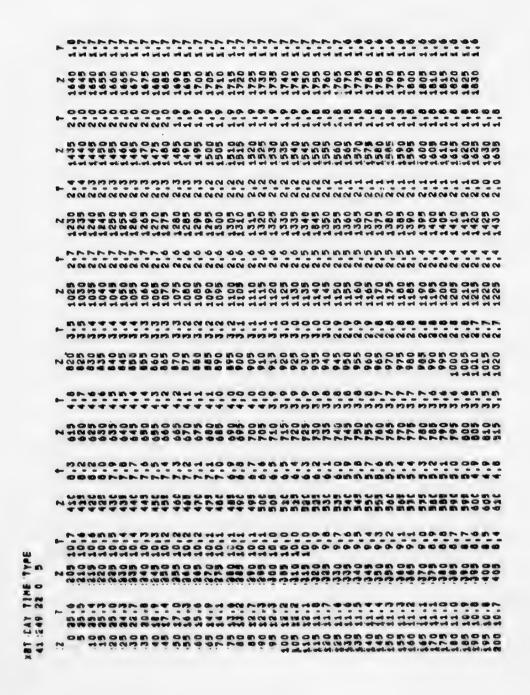
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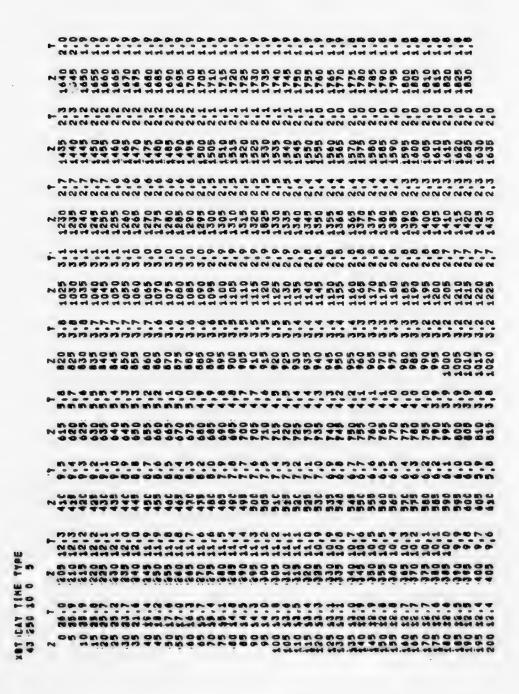
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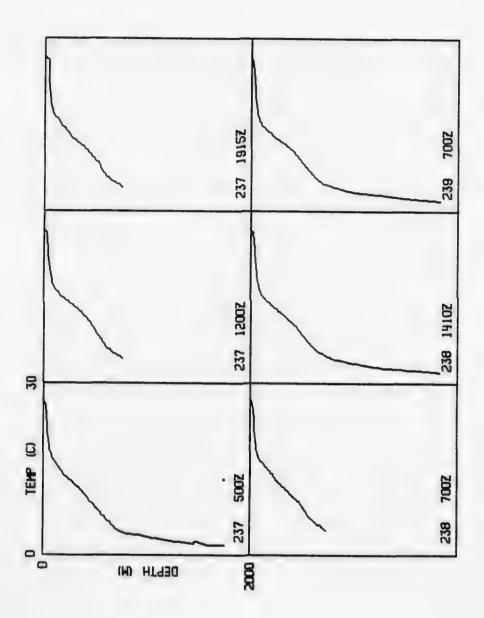


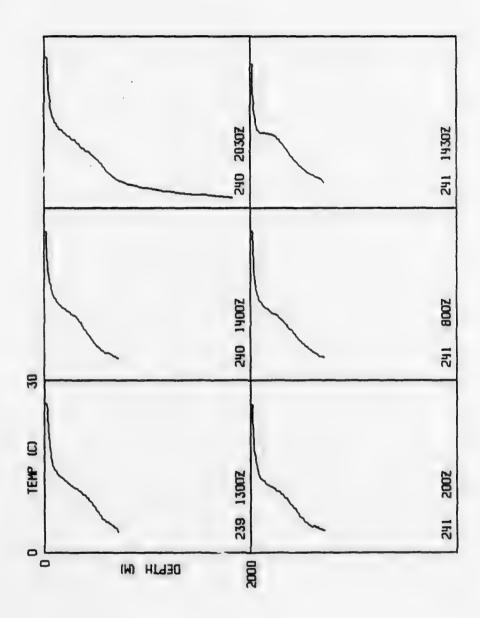
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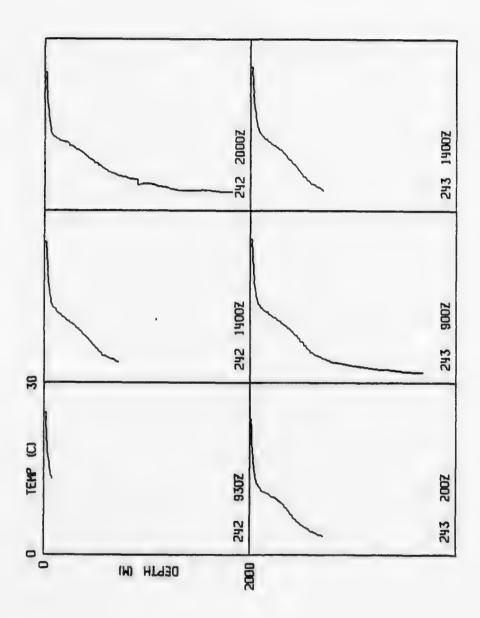
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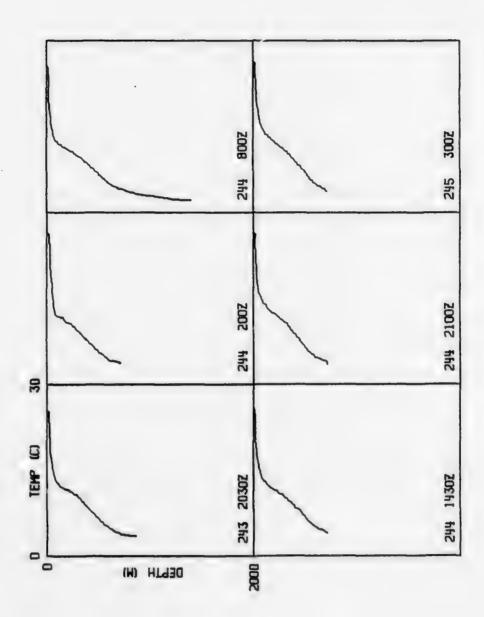
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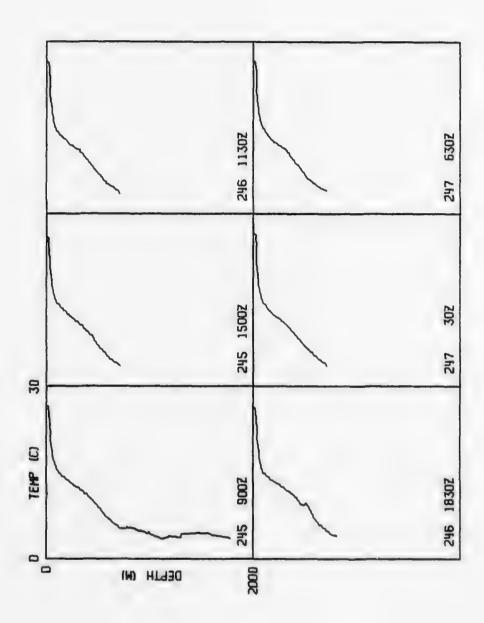
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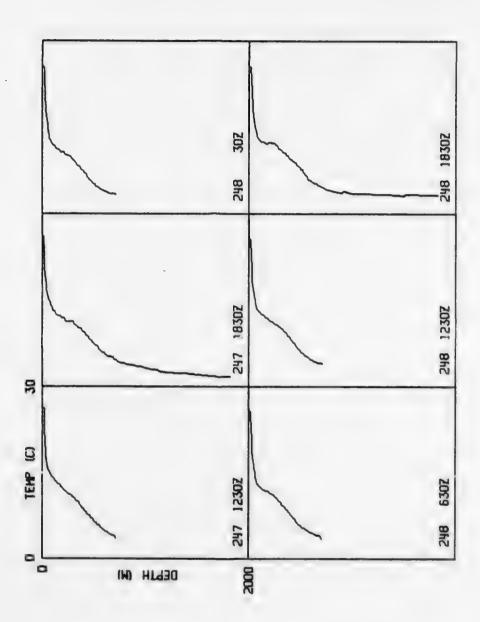




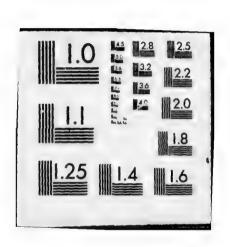


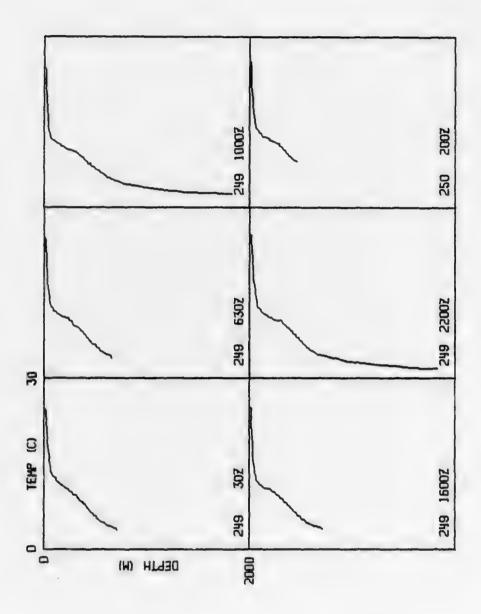


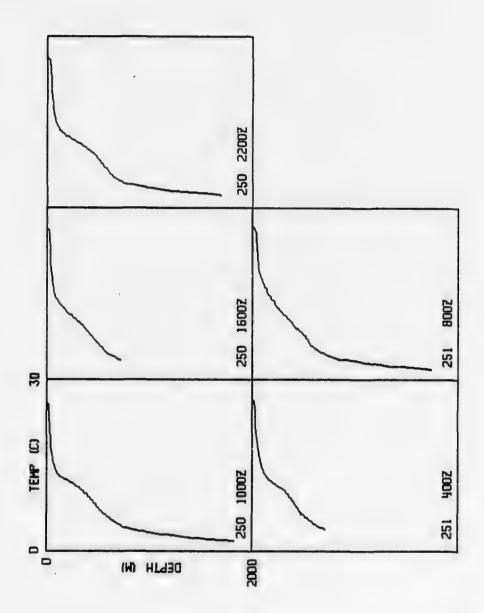










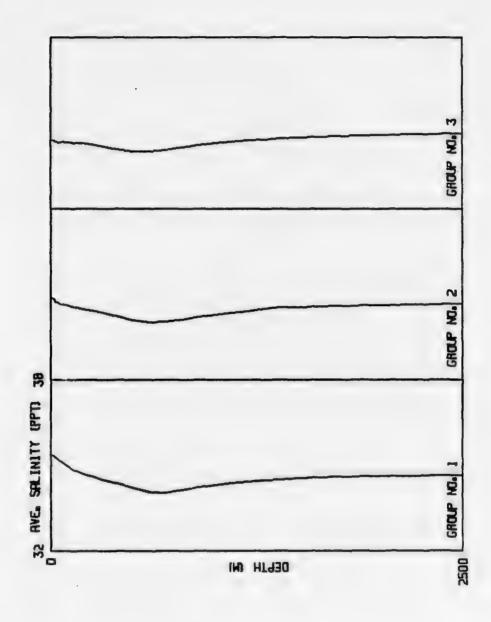


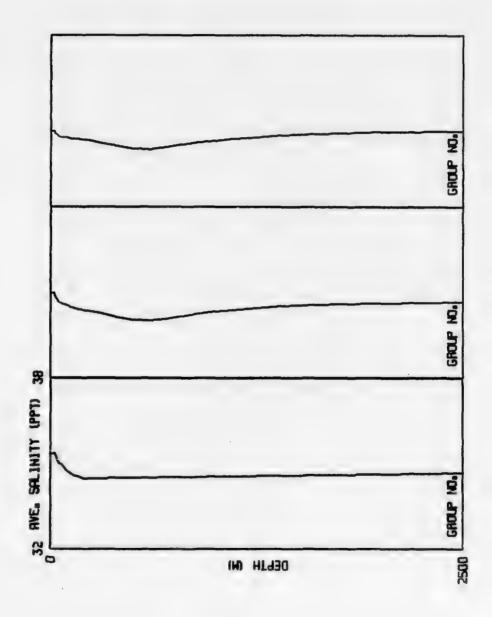
## APPENDIX E

This appendix contains group salinity vs. depth and sound speed vs. depth profiles representative of the archival profiles in the neighborhood of the ship's track.

ARCHIVAL SALINITY AND SOUND SPEŁU PROFILES

			10																													
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## APPENDIX F

This appendix contains the calculated sound speed profiles.

ONNO	OUND SPEEN PROFILES	TOF ILE		ZAT.	XAISEQUENTIAL XBT NUMBER DAYJULIAN DAY TIMESEQUENTIAL ARCHIVAL GROUP NUMBER. GROUPSEQUENTIAL ARCHIVAL GROUP NUMBER. ZSEPTH (M) CSOUND SPFED (M/SEC)	EQUENT ULTAN MT EQUENT ROM AP EPTH (	DAY  TAL ARCHI PENDIX E-	ABT NUMBER ARCHIVAL GR IX E.	NUM BUD	ER.					
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10				450		670	1481.29		1478.53	1110	1479.02	1330	1490.68	1550	1483.17
2				455	1494.27	675	1480.97		147A.62	1115	1479.11	1335	1480.33	1555	1483.20
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200				475	-	695		918	1478.56	1135	479.03	1355	1480.68	1575	1483.16
40				480	_	700	200	920	1478.65	1140	1479.12	1360	1480.77	1580	1483.25
				483		105	~ •	926	1478-74	1145	14/9.21	1365	1480.R5	1585	1482.89
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75			-	515		735	-	955	1478.85	1175	1479.30	1395		1615	1483.41
90				520	_	740		960	1474.94	1180	1479.39	1400		1626	1487.50
82			~	525	_	745	-	965	1478.61	1185	1479.4R	1405	~	1625	1483.56
0			-	530		750	_	970	1478.70	0611	1479.56	1410	_	1630	1483.67
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125			~	565		785	_	1005	1478.89	1225	1479.74	1445	~	1665	1484.2
130	35,1161		-	570		190		1010	1478.98	1230	14/9.82	1450	1481.45	1676	1484.30
140			-	280		800		1020	1478.73	1240	480.00	460	-	1680	1484.05
145			_	585		808	_	1025	1478.82	1245	1480.08	1465	-	1685	1484.17
150			1499.83	065		830	_	1030	1474.91	1250	1480.17	1470	~	1690	1484.20
100				CAC		2 0	_	CF DT	1478.90	1255	1419.82	57.5	~ *	1075	
165	1509.20		1499.00	900	1485.05	825	477.79	1040	1478.74	1265	479.99	1485	1483,36	705	1484.5
170	-			410		830	1477.88	1050	1478.83	1270	1480.08	1490		1710	1484.6
175	_		_	615		835	_	1055	1478.92	1275	1480.16	1495	~	1715	1484.69
180	1508.46		_	620		840	_	1060	1479.00	1280	1480.25	1500	_	1720	1484.7
000			_	020		0 40	_	0201	0.674	101	4800.34	200	1463.27	34.	1484.00
105	1507.06		-	635		855	-	1075	1478.84	1295	1480.07	21.5	-	1735	1485.0
200	-			940		860	_	1080	1479.93	1300	1480.16	1520	-	1740	1485, 12
202	_		_	645		865	_	1085	1479.01	1305	1480,25	1525		1745	1485,21
210	1506.30	430		650	1482.59	870	1478.17	1090	1479.10	1310	1480.33	1530	1483.27	1750	1485.29
212			_	200	1482.21	670	1478.26	1095	1479.19	CLET	2400041	1535	1483,35	100	14H5.3C

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	U	1482.90	1482.98	1483.07	1663.10	200	1683.41	1483.50	1463.49	1493.67	1483.76	1483.84	1463.93	16.96.01				1486.01	1446.10	1484.10	1484.27	1486.15	1484.44	24.45	4.00	1000		1684.52	1484.40	1484.40			1485.03	1405.12	1485.70	1465.29	1464.94	1485.02	1443.11	02.500	200000	1485.45	
	2	1380	1395	1390	CAF	400	1410	1415	1420	1425	1430	1435	0 1	1445			1	1470	1475	1490	1485	1490	1495	1500	1505		620	1575	1530	1535	240	26.0	555	1560	1565	1570	1575	2580	1585	2000	240	1605	
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	7	1150	1155	1160	0	140	1180	1185	1190	1195	1200	1205	1210	1215	1225	222	25.45	1240	1245	1250	1255	3240	1245	1270	1275	200	1200	1295	1300	1305		1336	1325	1330	1335	1340	1345	1350	1355	1360	240	1375	
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	U	1482.01	1481.69	1481.77	60.1001	1481.22	1481.31	1480.99	1480.67	1480.76	1480.43	1480,52	1490.61	1480.25	2000		1480.23	479.00	1479.99	1480.08	1479.75	1479.84	1479.93	1480.02	1479.00	1479.87	470.04	1440.05	1479.72	1479.81	479		1479.75	1479.84	1479.93	1480.02	1480.11	1480.20	10°4141	1414,45	1400.00	1480.22	
	~	069	695	000		7	720	725	730	735	740	745	120	155	0 7 7	100	775	780	785	190	195	800	808	9	2	828	830	835	840	848	200	900	885	670	875	980	802	000	649	000	0	918	
٠ م	ပ	1494.54	1494.25	1493,95	1693.00	1403.06	1492.39	1492.09	1491.79	1491.49	1491.19	1490.90	1490.60	1490.30			1486.70	1488.40	1486.09	1487.78	1487.47	1487.16	1486.85	1486.54	1406.23	1400.01	1485.28	1484.97	1484.66	1404.75	***	1443.81	1483.49	1463.18	1482.86	1482.95	1482.63	1482.71	04.2041	1406.40	1406.10	1481.92	
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S DAY 2	U	1537.67	1537.92	1538,21	1238061	1536.98	1536.09	1535.67	1530.09	1529,39	1526.33	1522.91	1520.77	1516.60	1510.76	131000	1511.28	1512.45	1511.69	1511.06	1510.52	1509.97	1509.42	1509.18	1506.94	1508.10	1508.22	1507.97	1507.73	1507.16	1506.92	15.06.42	1506.49	1506.24	1506.32	1505.74	1505.49	1505.23	1504.75	1500.00	1504.55	1504.62	
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	•	-		_	_	944	~	~	_	_	~	_	_	-	1485.	_	_	_	_	~	-	-	_	1486.	_	_	_	_	-	1484.	~	_	-		1487	_	_	1487	~	_	~	87	-	-	1487	
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	0	1482.47	1482.55	1482.64	1482.73	1482.81	1482.90	1482.08	1483.07	1483.16	1483.24	1483,33	1482.98	1483.06	1483.15	1483.24	1483.32	1483.41	6493.49	1483.58	1483.66	1483,75	1483.84	1483.92	1484.01	1484.09	1484.18	1484.26	1483.92	1484.00	1484.09	1484.17	92.484			484.60	484.69	484.77	1484.A6	1484.94	1485.03	-		1484,45	1484.93	1485.02
	7	1380	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	1480	1485	1490	1495	1500	1505	1510	1515	1520	1525	1530	1535	1000	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605
	U	-	-	1480.73	-	-	-	7	7	-	-	-	7	-	7	-	-	-	-	7	-	_	_	-	-	-	_	_	_	_	_	_		_	1481.87			_	-	_	_	_	_		1482.30	1482,38
	-	1150	1155	1160	1165	1170	1175	1180	1185	1190	1195	1200	1205	1210	1215	1220	1225	1230	1235	1240	1245	1250	1255	1260	1265	1270	1275	1280	1285	1290	1295	1300	1305	2151	1320	1325	1330	1335	1340	1345	1350	1355	1360	1365	1370	1375
	U	1479.47	1479.56	1479.64	1479.73	1479.82	1479-91	1479.57	1479.66	1479.75	1479.84	1479.93	1480.02	1479.6A	1479.77	1479.86	1479.95	1480.03	1480.12	1480.21	1479.87	1479.96	1480.05	1480-14	1480.23	1480.32	1480.40	1480.07	1480.16	1480.24	1480.33	1480.42	1480.51	1480.24	1480.35	1480.44	1480.53	1480.61	1480.70	1480.35	1480.45	1480.54	1480.63	1480.71	14RD.AD	1480.89
	7	920	926	930	935	046	945	950	955	960	965	970	915	980	989	966	966	1000	1005	1010	1015	1020	1025	1030	1035	1040	1045	1050	1055	1060	1065	1070	2012	1000	1090	1095	1100	1105	1110	1115	1120	1125	1130	1135	1140	1145
	U	1481.60	1481,28	1481,37	1481.05	1481.14	1480.81	1480.90	1480,99	1480.67	1480.76	1480.43	1480.52	1480.61	1480,29	1480,38	1480.46	1480.14	1480.23	1480,32	1479.99	1480.08	1480.17	1479.84	1479.93	1479.60	1479.69	1479.78	1479.87	1479.54	1479.63	1479.72	1479.81	1479 57	1479.66	1479.75	1479.84	1479.51	1479.60	1479.69	1479.78	1479,87	1479.54	1479.62	1479.71	1479.80
	7	9	969	700	705	710	715	720	725	730	735	740	145	750	755	760	165	770	175	180	785	190	195	800	805	810	815	820	52	830	835	9	0 0		999	865	870	675	888	985	890	895	006	306	910	415
5 9	U	1494.17	1493,88	1493,95	1493.66	1493,36	1493.06	1492.76	1492.46	1492.16	1492.24	1491,95	1491,65	1491,35	1491.05	1490.75	1490.45	1490.15	1489.85	1489.93	1489.63	1489.32	1488.63	1468,33	1468.02	1487.71	1487.01	1486.70	1486,39	1486.07	1485,37	1485.06	1404.15	1484 52	1484.21	1483.90	1483.58	1483.67	1483,35	1483.03	1482,72	1482,80	1482.48	1482,16	1482.25	1481.43
GROUP	2	460	465	470	475	480	185	490	495	200	505	510	515	520	525	530	535	240	242	555	553	260	20.5	570	2	580	585	290	295	004	509	970	6	425	630	635	940	645	929	455	999	500	670	675	680	000
TIME 2030		1502.37	1502.11	1501.84	1501.92	1501.66	1501.39	1501.13	1500.86	1500.94	1500.67	1500.75	1500.48	1500.56	1500.64	1500.37	1500.44	15no.17	1489.90	1499.62	1499,35	1499.42	1409.15	1498.87	1498.60	1497.97	1497.69	1497.41	1497.12	1496.84	1496.91	1496.99	1497.00	1406.16	1495.85	1495.56	1495.63	1495.71	1495.42	1495.49	1495,56	1495.27	1495.34	1495.05	1404.76	1404.41
240 1	2	230	235	240	245	250	2	260	265	270	275	280	265	290	295	390	200	310	315	350	328	330	338	340	345	320	322	360	365	370	375	380	383	100	004	4.65	410	415	420	524	430	435	044	442	450	400
DAY 2		37.16	137.23	137.52	37.58	37.87	137.91	37.26	133.76	128.30	124.13	122.28	150.41	116.50	116.26	114.56	113.44	112.30	11.40	19.019	90.019	000-50	506.54	60.00	107.64	507.28	\$0.700	200.47	22.909	505.65	202.07	61.600	000	40.50	504.46	104-21	103.95	103.69	503.77	503.51	503.25	502.99	503.07	502.81	502.55	50.200
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	2	pro	-	1620		_	-	-	-	-	-	1660	1665	1670	1675	1680		_	-	900	-	_		-	-		1735	1740	1745	1750	1755	1760	1765	1770	1775	1780	1785	1 790	1795	1800	1805	1810	1815	1820	1825	1830	
	U	1497.09	1487.18	1487.27	1480.03	1487.02	1487.10	1487.19	1487.28	1487.36	1487.45	1487.53	1487.62	1487.71	1487.79	1487.AB	1487.97	1488.05	1488.14	1488.22	1488.31	1488.40	1488.4R	1488.99	1489.nB	1489.16	1489.75	1489.34	1489.42	1489.51	1490.01	1490.10	1490.19	1490.27	1490.36	1490.02	1490-11	1690.19	1490.28	1489.04	1490.03	1490.11	1490.20	1490.29	1490.37	1490.46	1490.54
	2	1380	1385	390	1362	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	1480	14.85	004	1495	1500	1505	1510	1515	1520	1525	1530	1535	1540	1545	1550	1555	1560	1565	1570	1575	1580	1585	1590	1595	1600	1605
	U	1485.62	1485.70	1485.79	400.40	1485.55	1485.63	1485.72	1485,39	1485.46	1485.57	1485,65	1485.74	1485.41	1485.49	1485.58	1485.67	1485,33	1485.42	1485.51	1485.59	1485.60	1485.77	1485.43	1485.52	1485.61	1485.69	1485.78	5	1485,95	'n	1485,70	ហំ	'n	5.0	1486.05	1486.14	1486.22	1486.31	ø	1486.48	ø	1486.66	•	1486.83		1487.01
	7	1150	1155	1160	1163	1170	1175	1180	1185	1150	1195	1200	1205	1210	1215	1220	1225	1230	1235	1240	1245	1250	1255	1260	1265	1270	1275	1280	1285	1290	1295	1300	1305	1310	1315	1320	1355	1330	1335	1340	1345	1350	3325	1360	1365	1370	1375
	U	1483.25	1483.34	1483.43	1483,52	1484.02	1484.13	1484.19	1484.2R	1484.78	1484.B7	1484.96	1485.05	1485-13	1485.22	1485.31	1484.99	1485.0A	1485.16	1485.25	1485.34	1485.47	1485.51	1485.60	1485.6A	1485.36	1485.45	1485.53	1485.62	1485.71	1485.79	1485.47	1485.55	1485.64	1485.31	1485.40	1484.49	1485.16	1485.25	1485.33	1485.42	1485.51	1485.60	1485.6A	1485.77	1485.44	1485.53
	~	920	928	930	935	046	945	950	955	960	968	970	975	980	985	066	995	1000	1005						1035	1040	1045	1050	1055	1060	1065	1070	1075	1080	1085	1090	1095	1100	1105	1110	1115	1120	1125	1130	1135	1140	1145
	U	1486.06	1486.15	1486.24	1445.43	1486.02	1485.71	1485.80	1485.89	1485,98	1486.06	1486,15	1486,24	1485.93	1486.02	1486.11	1486,20	1486,29	86.	1486.07	1486.16	1486.25	1485,93	1486.02	1485,71	1485,80		S	1485.66	1485,75		1485,92		440	1486.19	1486.27	1485.96	1486.05	1486.14	1486.22	1486.31	1486.40	*	m	1482,99	1482,66	1482.75
	7	069	695	700	00	710	22	120	125	730	735	740	745	750	755	760	765	770	775	780	785	190	195	800	808	910	912	820	825	830	835	840	845	850	855	860	865	870	875	880	885	890	895	900	908	910	915
E 9	v	1492,21	1491.92	1491.99	14%1.00	1491.40	1491.11	1490.81	1490.89	1490.96	1490.67	1490.75	1490.46	1490.16	1489.48	1489.56	1490,03	1490.11	1489,81	1489.51	1489.21	1468.91	1488.61	1488.69	1488,39	1488.47	1488,16	1488,25	1487,94	1488,02	1487.72	1487,03	1487,12	1486.81	1486.90	1486.99	1485.68	1486.77	1486.86	86.	1486.64	1486.72	1486.42	1486.50	1486.20	1486.28	1486,37
GROUP	2	460	465	470	0.4	480	485	490	495	200	505	510	515	520	\$25	530	535	540	545	920	555	260	565	570	575	580	585	290	595	600	405	919	615	620	625	630	635	0+9	645	650	655	999	999	670	675	680	685
TIME 20 0	U	1499.09	1498.82	1498.55	1407.43	1497.65	1497.73	1497.81	1497.54	1497.61	1497.69	1497.76	1497.49	1497,21	1497.29	1497.01	1497.09	1496.81	1496.89	1496,61	1496.68	1496.40	1496.48	1496,20	1496.27	1495.99	1496.07	1495.79	1495,86	1495.58	1495.29	1495,01	1495.08	1494.80	1464.51	1494.59	1494.30	1494.01	1493,73	1403.44	1493.15	1492,86	1492.93	1492.64	1492.72	1492,43	1492.13
242	7	230	235	240	242	220	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355	360	365	370	375	380	385	390	395	400	405	410	415	420	425	430	435	044	445	450	455
S DAY	v	1532.07	1532.15	1532.23	1532.00	1532-14	1528.70	1519.09	1516.57	1514.00	1511.66	1509.58	1507.16	1505.02	1503.49	1502,27	1501,69	1501.77	1501.52	1500.94	1500.68	1500.76	1500.50	1500.58	1500.33	1500.07	1499.81	1499.89	1499.63	1499.71	1489.44	1499.52	1499.26	1499,34	E+*66+1	1499.51	1489.25	1499.33	1499.41	1499.50	1499.58	1499.66	1499.39	1499.47	1499.55	1499.28	1489.35
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	C 241	1477.33	1477.42	1477-08	1011-11	1011.24	1477.43	1477.52	1477.61	1477.27	1477-36	1477.45	1477.54	1477.63	1477.71	1477.38	1477.46	1477.55	1477.64	1477.73	1477.82	14:7.91	1477.57	1477.65	1477.74	1477.83	1477.92	1479.01	1478.10	1477.76	1477.84	1477.93	1478.02	1478.11	1478.19	1478.28	1477.94	1478.03	1479-11	1478.20	1478.29	
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E 4	1491.22	1490.92	1490.63	1490.33	50.04	54041	1400	1489.21	1468.91	1468.60	1488.30	1488.00	1487.31	1487.00	1486.69	1486,38	1486.46	1486,16	1485,85	1485,15	1484,84	1484,53	1484.22	1483,90	1483,59	1483,28	1482,96	1482.64	1482,33	1482.01	1481.69	1481.77	1481.45	1481,13	1480,81	1480.89	1480.57	1480.25	1479.93	1480.02	1479.69	
GROUP	420	425	430	438				94	465	470	475	480	485	190	495	200	505	510	515	520	252	230	535	240	545	250	555	260	265	570	575	280	285	290	295	009	605	410	615	620	459	
11ME 9 0	1408.44	1498.51	1498.24	1498.32	1448.05	1496615	407.03	497.66	1497.38	1497.46	1497.16	1496.91	1496.99	1496.71	1496.79	1496.51	1496,23	1496.31	1496.03	1495,75	1495.46	1495,54	1495.26	1404.97	1495.05	1404.77	1404.48	1464.19	1494.27	1493.98	1493.69	1403.41	1403.48	1403.19	1492.90	1492,61	1492.68	1492.39	1492-10	1491.81	1401.51	
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DAY	1534.01	\$34.09	1534.17	534.25	1034.04	53.00	519.71	517.50	514.95	1513,23	1511.20	1509.13	1807.97	1506.80	1202.61	1504.40	1503.83	1503.58	1503.00	1502.75	1502.17	1501.92	1501.07	1501.41	1501.16	1500.90	1500.98	1500.72	200.40	1500.20	82.00S	200000	11.0041	1499.85	1500051	1499.67	1499.07	1498.81	498.89	1498.63	1498,71	
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39 DAY	1532.56	1532,08	1532.96	1531.90	1526.90	1519.09	1513,63	130%	1402 56	1501.34	1499.76	1498.50	1497.91	20.7441	1407	1496.86	1496.94	1496.68	1496.76	1496.49	16.04.	1496.04	1496.11	1495.84	1495.57	495	1495.45	1495.19	1494.92	495	1494.73		1404.26		6	464	1493,87	493.	1494.02	<b>493</b> °
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	U	1481.10	1481.19	1481.27	1681.36	4.01	481.62	1481.70	1481.35	481.44	1481.53	1481.61	1481.70	1481.78	1481.87	1481.96	1482.04	1482.13	1482.72	1482,30	1482.39	1482.04	1482.13	1482.21	1482,30	1482.38	10.2841	482.50	402 42	482.A1	1482.90	1482,98	1483.07	1482.72	1482.A0	AE - 384	1482.98	90 . 5991	603.10	520500	1463.36	100000	485.44	1483.KB	1483.60
	7	1340	1385	1390	1395	400	410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	1480	1485	3490	1495	1500	1505	1510	1515	135	1530	1535	1540	1545	1550	1555	200	1965	1570	0 0	200	000	1240	1595	1600	1605
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	v	1476.97	1477.06	1477.14	1477.24	476.99	1477.0R	1477-16	1477.25	1476.91	1477.00	1477.09	1477.18	1477.26	1477.35	1477.44	1477.53	1477.62	1477.27	1477.36	1477.45	1477.53	1477.62	1477-71	1477.80	1477.98	1411-41	3678-05	1478 22	1477.89	1477.97	1478.06	1478-15	1478.24	1478.32	1478.41	1478.50	1478.58	1410.01	01.01.1	1478.84	14/0-43	1477.57	1478.67	1478.76
	N	920	925		040	940	980	955	960	965	970	975	980	980	000	666	000	1005	1010	1015	1020	1025	1030	1035	1040	1045	000	1060	306	1070	1075	1080	1085	1090	1095		6011	011	200	2711	2711	11.50	1135	1140	1145
	U	1477.13	1477.22	1477.30	1477.39	1477.15	1477.24	1477,33	1477.42	1477.09	1477,18	1477.27	1477.36	1477.45	1477.12	1477.21	1477.30	1477,38	1477.47	1477.14	1477,23	1477.32	14-11-41	1477.08	1477.16	1477.25	1477.50	1477 00	1477 19	1477.27	1477,36	1477.44	1477,11	1477.20	1477.28	16/10.57	1477.03	1411.12	170.100	000 111	10.10	14// 05	1477.14	1477,23	1477.31
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m a	v	1486.56	1486.25	48. CD+1	1460.02	1485.40	1485.08	1484.77	1484.46	1484.14	1484.23	1483.91	1483.60	1463,29	1482.97	1482.05	1482.34	1482.02	1461.70	1481,38	1481.06	1480.74	1480,82	1400.49	1480.17	1479.84	200111	1470 27	1470 24	1479.04	1479,13	1478.80	1476.48	1478.57	1476.24	2010	1418.00	60.07	27.4		20'1101	1411.60	1411.20	1417.37	1477.04
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DAV 2	v	135.70	135.54	45.050	1535.63	12.96	129.01	124.06	510.04	514.53	113.39	111.35	12.60	107.15	00.00	103.11	501.03	42.00	20.46	1000	69.86	24.864	69.02	197.70	20.76	107.15	04.07	100	196. 78	196.51	196.59	196,32	196.05	196.13	193.83	100.00	00.00	10.00	01.00	106 37	000	70	00.644	104.70	00.46
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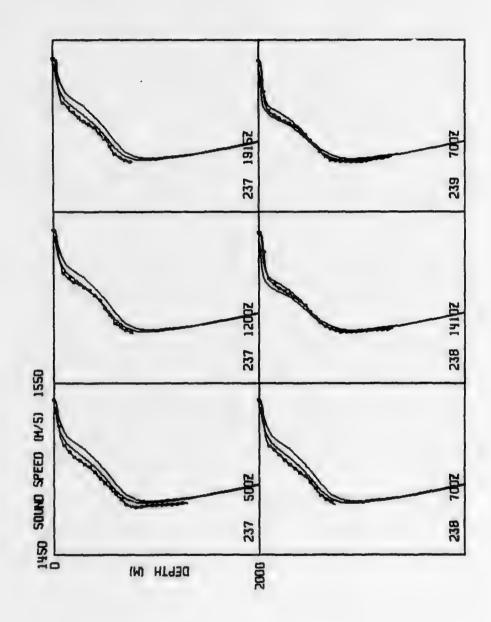
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	2	1610	1615	1620	1625	1630	1635	1640	1645	1650	1655	1660	1665	1670	1675	1680	1685	1690	1698	1700	1705	1710	1715	1720	1725	1730	1735	1740	1745	1750	1755	1760	1765	1770	1775	1780	1785	1790	1795	1800	1805	1810	1815	1820	1825	1830	
	U	1482.40	1482.49	1482.14	1482.23	1462.31	1482.40	1482.49	1482.57	1482.66	1482.74	1482.83	1482.92	1483.00	1482.66	1482.74	1482.83	1682.91	1483.00	1483.09	1483.17	1483.26	1483.35	1483.43	1483.52	1483.17	1483.76	1483.34	1483,43	1483.51	1483.40	1483.68	1483.77	1483.86	1483.94	1464.03	1483.68	1483.76	1483.A5	1483.94	1484.02	1484.11	1484.19	1484.28	1484,36	1484.45	1484.54
	M	1380	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	1480	-	-		_	_	_	-	_	-	-	_	_	_	_	_	7	-	-	_	_	-	1590	-	-	-
	o	1480.13	1480.22	1480.31	1480.39	1480.48	1480.57	1480.65	1480.74	1480.83	1480.93	1481.00	1480.66	1480.75	1480.83	1480.92	1481.01	1481.09	1481.18	1481.27	1481.36	1481.44	1481.10	1481.19	1481.28	1481.36	1481.45	1481.54	148:562	1561.71	1481.37	1481.46	1481.54	1481.63	1481.71	1481.80	1481.89	1481.97	1482.06	1481.71	1481.80	1461.88	1481.97	1482.06	1482.14	1482,23	1482.32
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	U	1479.10	1479.19	1478.85	1478.94	1479.03	1479.12	1479.21	1479.29	1478.94	1479.05	1479.13	1479.22	1479.31	1479.40	1479.06	1479.15	1479.24	1479.33	1479.41	1479.50	1479.59	1479.25	1479.33	1479.42	1479.51	1479.60	1479.6A	1479.77	1479.43	1479.52	1479.60	1479.69	1479.74	1479.87	1479.95	1479.61	1479.70	1479.79	1479.87	1479.96	1480.04	1480-13	1440.22	1480.30	1479.96	1480.04
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TIME 10 0	v	1500.51	1500.24	1500.32	1500.05	1500.13	1499.85	16.66	1499.67	1499.40	1400.47	1499.20	1498.93	1499.00	1498.73	1498.46	1498.53	1496,26	1498.33	1498.06	1497.78	1497.86	1497.58	1497.30	1497.02	1496.74	1496.82	1496.54	1496.26	1498.97	1495.69	1495.77	1495.48	1495.20	1464.91	1494.62	1494.34	1494.05	1493.76	1493.47	1493.18	1492.89	1492.60	1492.31	1492.01	1491.72	1491.42
250 T	2	230	235	2.0	500	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	338	340	345	350	355	360	365	370	375	380	385	390	382	004	405	410	415	420	425	430	435	440	445	450	455
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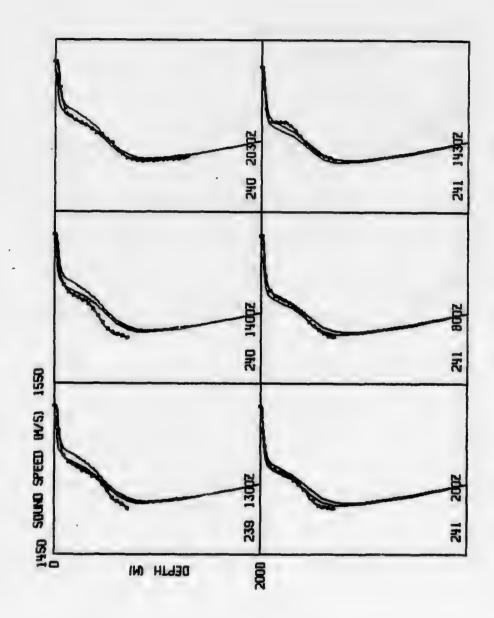
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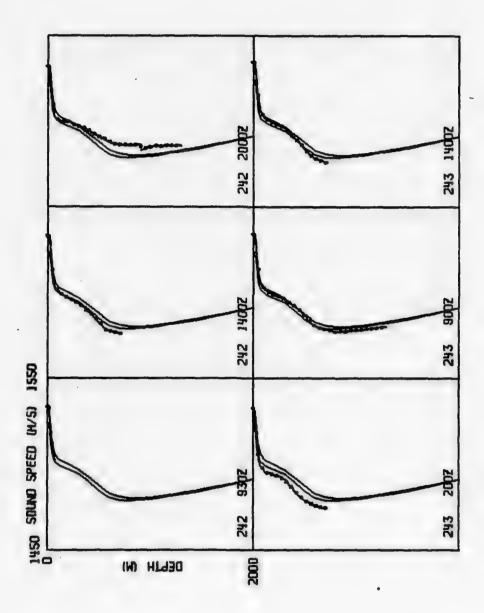
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	L	1479.71	1479.An	1479.47	1479.54	1479.65	1479.74	1479.A7	1479.92	1479.59	1479.68	1479.77	1479.86	1479.94	14An.na	1480.17	1479.79	1479.AR	1479.97	1480.04	1480.15	1480.23	1479.90	1479.99	1480.04	1480.17	1480.24	1480.35	1480.43	1480.10	1480.19	1480.24	1480.36	14.014.	46.00	1480.20	400 20		1400 55	100000	PRO CHA	1480.73	1480.30	1480.4B
	7	860	965	A70	875	8.0	985	A 00	895	900	905	910	915	920	929	930	935	0	945	950	955	960	965	970	915	980	988	066	995	1000	1005	1010	1015	020	2000	1035	1	2 4 0 6	1060	1000	500	1901	1000	0/01
	c	1482.08	1481.76	1481,44	1481.52	1481.20	1481.29	1480.96	1481.05	1480.73	1480.81	1480.49	1480,58	1480,25	1480,34	1480.02	1480.11	1479.79	1479.47	1479.56	1479.23	1479,32	1478.99	1479.08	1479.17	1479.26	1478.94	1479.03	1479.12	1479.21	1479.30	1479,39	1479.4H	1470 24	470 33	1479 42	1470 51	1470 60	1474 27	14.70 34	05 06 1 0	1479.45	1477.50	1479.02
	~	645	650	655	999	999	670	675	680	685	9	969	700	705	710	715	720	125	730	735	740	145	750	755	160	165	110	175	780	185	190	195	0	000	9	820	ASE	8 6	A 36	9 4	0 0	0	000	822
<b>2</b> d	U	1495.47	1495.18	1494.89	1494.97	1494.68	1494.75	1494.46	1494.17	1493.88	1493.59	1493.29	1493.00	1492,33	1492.04	1491.74	1491.44	1491,15	1490,85	1490.56	1489.88	1489.58	1489.28	1488,98	1488.68	1487.99	1487.69	1487,38	1487.08	1486.77	1486.85	1466.54	1486.23	140001	1484	484 59	1444 28	1483 97	1483 66	1403.00	1403.04	1463.03	1486,11	1482.39
GROUP	2	430	435	044	445	450	455	094	465	470	475	084	485	490	495	200	505	910	415	520	525	530	535	240	545	550	555	260	565	270	575	280	260	200	1000	400	4	4	420	200	200	9 20	930	0
TIME 22 0		1501.01	1501.09	1500.82	1500.90	1500.64	1500.37	1500.45	1500.16	1500.25	1400.99	1500.06	1466.79	1400.87	1499,60	1499,32	1499.40	1499,13	1409,20	1498.93	1409,00	149A,73	1498.80	1498,53	1498.60	1498,33	1498.40	1498,12	1497.84	1497,92	1497.64	1497,36	E+010+1	1497,15	1404 08	1496.66	1494 JB	1404 48	1404 17	00 000	40 044	1495.95	1445.05	1495,39
250 T		215	220	225	230	235	240	245	250	255	500	265	270	275	280	285	290	562	300	305	310	315	320	325	330	335	340	345	350	355	360	392	0 10	28.0	4	000	305	100	405		110	415	450	429
45 DAY 2	U	1537.89	1537.77	1537,65	1537.50	1537,34	1537.12	1536.89	1532.86	1528.61	1524.43	1520,33	1518,98	1517.90	1515,34	1512.41	1511,25	1510.40	1509.22	1508,35	1507.15	1506.58	1506.00	1505,75	1505.17	1504.91	1504,32	1503.74	1503.48	1503.56	1503,30	1503.04	1502.10	1505.03	1602 35	1502.09	1501.83	1501.57	1501.31	1501021	2011001	21.1001	1201001	1201051
xBT 4	-	•	100	07	5	20	52	30	35	04	4.5	20	52	9	9	70	7.5	80	85	06	96	100	105	110	115	120	125	130	135	140	145	150	561	9 4	200	175	2 4	185	0	1	7 4 7	200	502	210

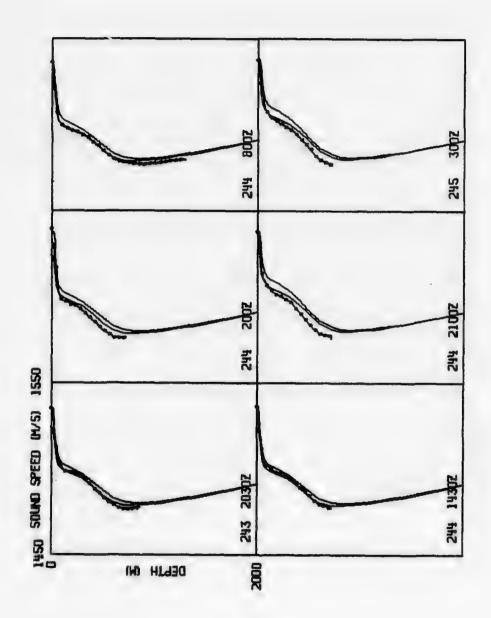
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5444655522516
24446555322516
•
251
XBT
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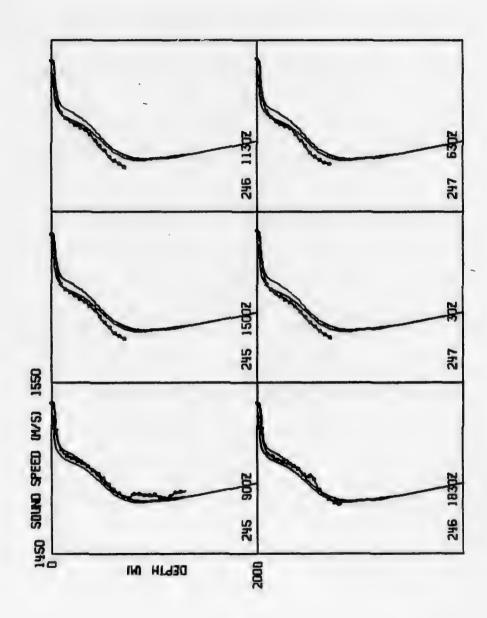
	M	1487.88	1483.97	1+84.05	1484.14	1484.22	1484.31	1484.39	14R4.04	1484.13	1484.22	1484.30	1484.39	1484.47	1484.56	1484.65	1484.73	1484.R2	1484.9n	1484.99	1485.0P	1484.72	1484.83	1484.90	1484.98	1445.07	1485.15	1484.24	1485.33	1485.41	1485.50	486.58	1684.67	- LOT	4 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	400	405 64	400		*******	1484.90				
											1585	1590	1595	1600	1605	1610	1615	1620	1625	1630	1635	1640	1645	1650	1655	1660	1665	1670	1675	1680	1685	0 40	200	300	1710	1716	1720	300	1765	1730	1734				
	U	1481.19	1481 . 45	1481.13	1481.22	1441.31	1481.39	1481.48	1481.57	1481.65	1481.74	1481.83	1481.91	1482.00	1482.09	1482.18	1481.83	1481.91	1482.00	1482.09	1482.17	1482.26	1482.34	1482.43	1482.51	1482.40	1482.49	1482.77	1482.86	1482.94	1483.03	1483.13	1483,70	40.000	1605041	2000	01.5041	00 20.	100000	1483.36	1483.45	1483.54	1483.62	1483.71	1483.79
	2	1320	1375	1330	1335	1340	1345	1350	1355	1360	1365	1370	1375	1390	1385	1390	1395	1400	1405	1410	1415	1420	1425	1430	1435	1440	1445	1450	1455	1460	1465	1470	1475	200	0 0 4	100	200	0000	1202	1510	1515	1520	1525	1530	1535
	U	1479.72	1479.38	1479.47	1479.55	1479.64	1479.73	1479.82	1479.90	1479.99	1460.08	1479.74	1479.82	1479.91	1480.00	1480.08	1480.17	1480,26	1480.35	1480.43	1480.52	1480.61	1480.69	1480.35	1480.44	1480.52	1480.61	1460.70	1480.7A	1480.A7	1480.94	1481.04	1481.13	97.000	14.00	4 . B. A.	14B1 13		2201001	1480.87	1480.96	1481,05	1481.13	1481.22	1491.31
	~	1100	1105	1110	1115	1120	1125	1130	1135	1140	1145	1150	1155	1160	1165	1170	1175	1190	1185	1190	1195	1200	1205	1210	1215	1220	1225	1230	1235	1240	1245	1250	1255	1366	1230	1276	1200	1000	527	1290	1295	1300	1305	1310	1315
		147A.39	147A.nS	1478.14	1474.27	1478.72	1478.41	1479.50	1478.59	1478.68	1479.77	1478.85	147A.94	1478.67	1474.70	1478.79	1478.87	1478.96	1479.05	1479.14	1479.23	1479.32	1470.41	1479.50	1479.14	1479.25	1479.34	1479.41	1479.51	1479.60	1479.49	1479.78	1479.44	200000	10.00	470 70	470.46	470 64	1014050	1479.67	1479.71	1479.80	1+10.44	1479.55	1479-61
	~	ARO	AA5	Ago	495	900	500	910	915	920	956	930	938	940	596	950	955	960	945	970	915	980	985	990	995	1000	1005	1010	1015	1020	1025	0601	1035	000	1050	LAKE	1040	2000	C C D .	1070	1075	1080	1085	1090	1095
	v	1480.30	1479.97	1480.06	1479.73	1479.AZ	1479.91	1479.58	1479.67	1479.34	1479.43	1479.11	1479.20	1478.87	1478,94	1479.05	1478.72	1478.81	1478.49	1478,58	1478.25	1478,34	1478.01	1478.10	1478,19	1478.28	1477,95	1478.04	1478,13	1470.22	1477.89	1477.98	1478,07	010010	1477 00	1470 00	1478 00	447 74	9101101	1477,85	1477.94	1478.03	1478,12	1478.21	1478,30
	7				675	680	685	069	695	700	705	710	715	720	125	730	135	740	745	750	755	160	165	170	175	780	785	190	195	800	805	0 0	200	979	830	836	9 4	2 4	0 0	850	822	860	865	870	875
2 4	U	1492.32	1492.02	1491.73	1491.80	1491.51	1491.58	1491,28	1490.98	1490.68	1490,38	1490.08	1489.78	1489.47	1489.17	1489.26	1488.96	1488.66	1487.97	1487.67	1487,36	1486,67	1486,36	1485.66	1485,35	1484,64	1483.93	1483.62	1482.90	1482,59	1482.67	1482.75	1402.43	1402011	1481 AB	1481 54	1481 45	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5501001	1481.01	1481.09	1480.77	1480.45	1480,54	1480.21
GROUP											Ş	06+	495	200	505	510	515	520	525	530	535	240	545	553	550	260	595	210	515	580	585	290	242	900	200	414	624	4.26	200	430	635	240	649	920	655
TIME 8 0	U	1504.77	1504.51	1503,93	1503.34	1503.08	1502.82	1502.56	1502.30	1502.03	1501.77	1501.50	1501.24	1500.97	1560,70	1500.43	1500.17	1499.90	1499.62	1499,35	1499.08	1499,15	1498.88	1498.60	1498.32	1498.05	1497.77	1407.49	1497.21	1496.93	1496.65	1496.36	1400	91.04.	1495 GD	404 04	1404.46	70.000	05.000	1404.07	1493,42	1493,12	1492.83	1492,54	1492.24
7 152	2	530	522	230	235	240	245	250	255	560	592	270	275	280	285	290	295	300	308	310	315	320	325	330	335	340	345	350	355	360	365	370	36.5	000	0 0	200	400		000	0	415	450	425	430	435
DAY	U	1539.03	1538.91	1538.80	1538.42	1538.49	1538.27	1538.05	1537.16	1536.49	1533.90	1530.72	1526.66	1522.41	1520.80	1519.46	1518.66	1517.67	1517,36	1516.55	1516.03	1515.51	1514.68	1514.15	1513.62	1512.78	1512,23	1512,00	1511.77	1511.53	1510.67	1504.61	1200	1508.46	1508 22	1507.08	1807.41		110,001	1506.60	1506,35	1506.10	1506.18	1505,93	1505,35
X8T 47	7													9	9	70	75	00	88	06	98	100	105	110	115	120	125	130	135	140	145	120	155	100	240	7.1			261	061	195	200	203	210	215

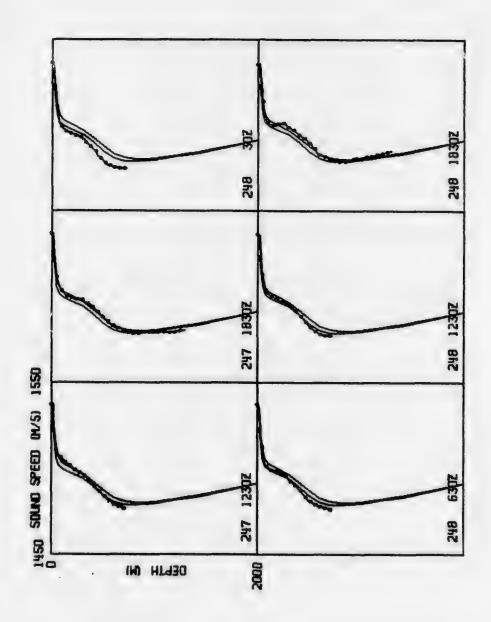


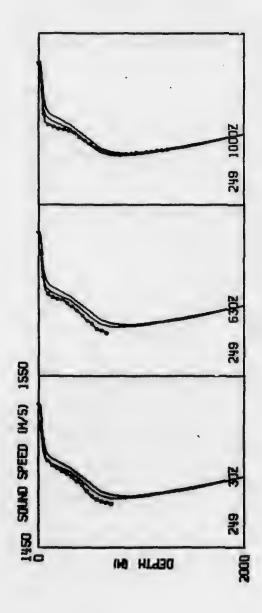


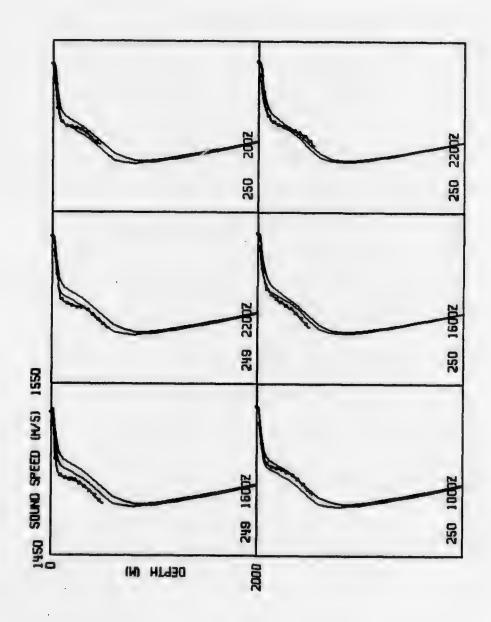


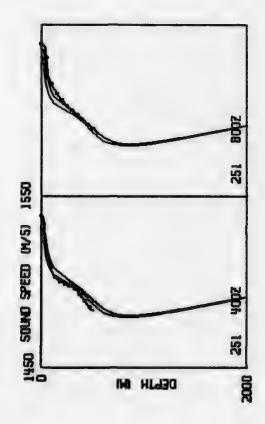












## APPENDIX G

This appendix contains the shipboard data pertaining to the explosive sources.

	2 0258 0801 0250 0801 0189	00000000000000000000000000000000000000	9000	80800 0040	00000000000000000000000000000000000000
	288880 60780 64846 74846	113 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<b>60 5000</b>	40400000000000000000000000000000000000	112222222224110222224241022222222222222
SEC.)	11 12 13 14 15 15 15 15 15 15 15 15 15 15 15 15 15	00000000000000000000000000000000000000	90 0000	# 000 000 000 000	
HAR HAN HIN	>00000	2222222222	222222	nnnnnnnnnn	00000000000000000000000000000000000000
SHOT E	V 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9999999999	0000000	O ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	08 46 54 40 E E E E E E E E E E E E E E E E E E
	24646	00000000000000000000000000000000000000	20025	00000000000000000000000000000000000000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
2 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0	400048	0488418808 0488408408 04940888 08088088	4000000	24540 2000000000000000000000000000000000	00 00 00 00 00 00 00 00 00 00 00 00 00
	3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00000000000000000000000000000000000000	20204407	00000000000000000000000000000000000000	0 44 44 44 44 44 44 44 44 44 44 44 44 44
	22 23 25 25 25 25 25 25 25 25 25 25 25 25 25	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	222222222222222222222222222222222222222	00000000000000000000000000000000000000	00000000000000000000000000000000000000
	40000	4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<b>50 4 4 4 4 4</b> 4 4	0/0004vvvvv	アアアき きききき ぎゅうきょう ちゃり まるり よろきゅう
4	946946	415 225 47C	00000000000000000000000000000000000000	107000 0	22 22 23 21 23 2 23 2 23 2 2 2 2 2 2 2 2
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XFL0S1VE	< 10 10 10 10 10 F	<b>000000000000</b>	<b>600000000</b>	<b>၈၈၈၈၈၈၈၈၈</b> ၈	00000000000000000000000000000000000000
EXF.	Z (4 1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	ない はない はい ちょくり	2224	2484696066	8888888884444 8484688884448

## APPENDIX H

This appendix contains the operating parameters of the CW sources. Table H1 contains the assigned source frequencies. Table H2 lists the periods during which the sources did not provide acoustic outputs at their assigned frequencies. Table H3 gives Mark 6 depth vs. time as determined from a measurement of the hydrostatic pressure at the source.

_	12H
Y Z Z	107
Y X X	OUE
GMTCHR	FRE
-	NCY
DAY	EQUÉ
TO	La

ASSIGNED SOLACE PREQUENCIES

	FREGUENCY 14.0000 14.0000 14.0000		FREQUENCY 153,80
	121 120 140 140 100 100 100 100 100 100 100 10		11ME
*	2444 2444 2444 2444 2444 2444 2444 244		EAY 242
HAR	0	<u> </u>	<b>©</b>
CE HARKS	# 0004 # # 0000 # 0000	OE	11 ME
SEUFCE	20000 20000 20000	SEUFOE	400

BNS
Z
0
-
-
0
3
RUP
15
E
w
-
4
-
140
EJ
5
-
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# &	5	SEURCE BN	3 54.0	25.0	3.0	5 00.0	14 29.0	18.0	5.0	SECURED
SEUFCE., PARK	ш	500.0	606.0	135.	430.	.000	531.	245	1645.0	600.0
3604	DAY	-	339	-	4	245	-	-	248	251

DAY:.....JULIAN DAY
TIME:...,GMT(MR MIN)
DURATION....LENGTH OF INTERRUPTION
(MR MIN)
SAURCE...EM

DAY TIME DURATION
239 0500,0 SGURCE ON
239 1806,0 13 54,0
242 2000,0 5 00,0
245 1931,0 14 29,0
246 1845,0 5,0
246 1845,0 5,0
246 1845,0 5,0
251 0800,0 SECURED

TIME.........GHT
DEPTH.......SOURCE DEPTH(M)

. ~ .				-	•	•	-	0	0	0	0	0	•	•	0	•	*			•	0	•	•	0	0	~		•	•	•	•	•	~	0	•	0	•	•	0	•	,
132	1 .		1 5	13	13	13	13	7	-	=	-	-	13	13	1.	13	13	2	13	13	7	13	2	-	7	=	13	2	-	-	-	-	-	14	-	14	-	13	-	1	
100	300	4	200	600	700	800	006	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0	100	200	300	400	200	600	700	800	006	1000	1100	1200	1300	1400	1500	1600	1700	1800	
249																																									
137	***	137	142	142	148	140	134	136	140	142	134	137		137	137	137	146	137	137	140	142	134	137	134	137	142	131	140	132	136	140	136	131	136		136	136	140	142	142	
000	100	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2151	2200	2300	0	100	200	300	400	200	600	200	800	000	1000	1100	1200	1300	1400	1500	1600	1700	1800	1845	1900	2000	2100	2200	2300	-
247	243	247	247	247	247	247	247	247	247	247	247	247	247	247	247	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	248	
148	145	4 65	148	148	143	145	145	152	152	152	145	149	149	152	152	152	155		137	140	137		137	137	132	127	127	127	130	131	131	140	140	137	140	136	137	137	137	137	
100	400	400	200	009	700	800	006	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	1931	1000	1100	1200	1242	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0	100	200	300	400	200	009	
44	24.5	245	245	245	245	245	248	245	245	245	245	245	245	245	245	245	245	245	246	246	246	546	246	246	246	246	246	246	246	246	246	246	246	247	247	247	247	247	247	247	
192	4		140	149	140	149	148	148	148	148	149	152	149	132	140	151	151	152	152	151	145	146	149	149	148	148	148	148	149	149	149	146	137	142	140	148	149	143	140	137	
96		000	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0	100	200	300	400	200	600	700	900	000	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	
24	24.5	263	243	243	243	243	243	243	243	243	243	243	243	243	243	243	244	244	244	244	244	244	244	244	244	544	544	244	244	244	244	244	244	244	244	244	244	244	244	244	
137	1 7		149	152	152	152	132	152	152	137	137	152	155	152	152		152	152	140		149	146	146	137	140	122	155	152	192	149	149	146	146	145	143	137	148	146	152	155	
000		1135	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	0	100	200	200	000	430	200	009	200	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1000	1900	2000	100	200	300	400	
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## APPENDIX I

This appendix gives the relation between the Julian day and the day of the month for 1970.